

REMARKS

Claims 1-34 are pending. Claims 1, 3-5, 12, 14, 15, and 23 have been amended, claims 2, 10, 13, 16 and 27 have been canceled, and claims 6-8, 17-19, and 28-30 have been withdrawn from consideration without prejudice to filing a divisional application claiming them. Bases for the amendments are found at specification page 2, lines 12, 17 and 20, page 4, lines 15, 16, and 32, page 5, lines 13-15 and 26-28, page 8, lines 18-21, page 9, line 29-page 10, line 3, page 10, lines 8-10, page 14, lines 10-15, page 15, lines 15-17 and 26-30, page 16, lines 17-32, page 17, lines 27-31, page 21, lines 3-5, page 23, lines 17-20, Examples 1 and 4, Figures 2-7, 26, 28 and 30 and in former claims 2, 10, 13, 16 and 27. Entry of the amendments and reconsideration of the application are requested.

Claims 1-4, 9, 12-15, 20-26, 31 and 32 have been rejected under 35 USC § 103(a) as obvious over Ishikawa U.S. Patent 4,730,494. This rejection has been avoided by the claim amendments.

Ishikawa teaches a method for evaluating a surface for defects due to machining damage (see abstract, column 3, lines 16-68 and claim 1). His method does not relate to identifying a material in a fluid that has been brought into contact with a surface acoustic wave (SAW) sensor as now specified in claim 1.

Although office action page 3, paragraph 5 states that, “Ishikawa et al disclose a method ... employing a surface acoustic wave sensor ... to measure phase frequency response...”, he does not use phase data in performing his method. The parts of Ishikawa to which the office action refers do not mention phase frequency response. Ishikawa refers to velocity versus frequency curves; while, the present application uses phase versus frequency curves. Velocity versus frequency curves have a different physical meaning and different mathematical properties from phase versus frequency curves (compare Ishikawa Fig. 3 to Fig. 4 of the present application).

Office action page 3, last 4 lines, states that Ishikawa discloses determination of frequencies corresponding to inflection points in the curves (referring to column 4, lines 18 et seq and fig. 3). Claim 1 has been amended to require +180 and -180 degree inflection points as illustrated in specification page 10, lines 25-28 and page 16, lines 17-32 and Figures 6, 7, 26, 28 and 30.

Although Ishikawa mentions inflection points (column 2, line 35, column 4, line 45, column 5, line 9) the inflection points of Ishikawa Fig. 3 are not the same as the phase inflection frequencies of amended claim 1. Amended claim 1 specifies $+180^\circ$ and -180° inflection frequencies as shown in Figs 4-7 of the application. They are frequencies at which the phase response curve essentially reverses direction, as shown in the figures. None of the curves in Ishikawa have phase inflection frequencies. The inflection points to which Ishikawa refers in his Fig. 3 are inflection points in a mathematical sense (i.e., points at which the slope of a curve changes), and his curves are in a propagation velocity vs. frequency graph, not phase v. frequency as required in the present claims.

Ishikawa uses inflection points for a different purpose other than the identification of a segment of phase frequency response as in amended claim 1. He uses frequencies corresponding to inflection points in a frequency dependence curve to obtain propagation velocity (claim 4) and evaluate layer thickness. The method of amended claim 1 uses phase inflection frequencies in the phase frequency response, near a running frequency, to identify a segment of the phase frequency response which serves as the basis for estimating time delay associated with wave propagation. Ishikawa does not disclose the steps of determining a phase frequency response, identifying a segment of the phase frequency response or using an identified segment in the way specified in amended claim 1.

Although the relationship between time delay and velocity may have been within the skill of the art, there is no teaching in Ishikawa about estimating a time delay based on an identified segment of a phase frequency response or estimating propagation velocity from the estimated time delay, which are required in amended claim 1. The fact that a relationship between parameters may be known, does not make it obvious to use that relationship in a method, in the sequence of steps specified in amended claim 1, to identify a material in a fluid as now required in claim 1.

Claim 5 has been amended to independent form by incorporating into it all the limitations of the claims from which it had depended. As it was objected to as being dependent on a rejected base claim, it should now be allowable.

Claim 11 is further distinguished over Ishikawa as (in addition to the distinctions applicable to claim 1) it specifies that the SAW sensor comprises a Love mode shear-horizontal surface acoustic wave sensor. Love mode SAW devices have not been found in Ishikawa.

Claim 12 has been amended by incorporating all the limitations from canceled claim 16. Since office action paragraph 8 indicates that claim 16 would be allowable if rewritten in independent form, claim 12, and the claims now dependent therefrom are allowable.

Claim 23 has been amended by incorporating all the limitations from canceled claim 27. Since office action paragraph 8 indicates that claim 27 would be allowable if rewritten in independent form, claim 23 and the claims dependent therefrom are allowable.

Claims 1, 9, 11, 12, 20, 22, 31, 32 and 34 have been rejected under 35 U.S.C. 103(a) as obvious over Haworth U.S. Patent 5,012,668. Claim 10 has been rejected under 35 U.S.C. 103(a) over Haworth in view of Nakanishi Japan Patent Publication No. 09-325134, and since the features from canceled claim 10 have been incorporated into claim 1 by amendment, claim 1 will be considered as rejected over this art combination as well. These rejections have been avoided by the amended claims.

Claim 1 has been amended to require bringing a fluid into contact with the surface of a SAW sensor and identifying a material in the fluid as a function of estimated propagation velocity, the estimated propagation velocity being estimated based on estimated time delay. Such features have not been found in Haworth. Although the Examiner has correctly noted the disclosure in Nakanishi of biological component inspection using SAW sensor propagation speed, there remain substantial differences between this combination of references and amended claim 1.

Claim 1 requires the steps of identifying a segment of phase frequency response by determining first and second phase inflection frequencies proximate a running frequency and estimating time delay associated with wave propagation through the SAW sensor based on the identified segment of phase frequency response. Such steps have not been found in Haworth or Nakanishi. Haworth does not suggest using a phase v. frequency curve (phase frequency response); nor does he suggest using any information from a phase frequency response to identify material in a fluid. A method taught in Haworth uses beat frequency in the output from mixer 134 as the parameter for measuring delay in acoustic wave propagation (column 11, lines

3-16). He does not disclose the technique of amended claim 1 (using estimated propagation velocity based on estimated time delay of wave propagation). Although Nakanishi states that organic component is detected in egesta using propagation speed in a SAW, it does not specify how the propagation speed is determined.

The assertion at office action page 5, lines 6-7 that Love mode acoustic sensor is suggested by Haworth's usage of interdigitated transducers 102 and 104 is traversed, and the Office is requested to provide support for it. As no reference has been cited showing that interdigitated transducers are predominantly used just with Love mode shear-horizontal SAW sensors, the office is requested to support this assertion or withdraw it. The Love mode SAW sensor limitation of claim 11 is a further distinction over Haworth.

Claims 10, 21 and 33 have been rejected under 35 U.S.C. 103(a) as obvious over Haworth in view of Nakanishi JP-325134. The rejection of claims 21 and 33 is moot, since those claims depend from claims that have been amended to be in allowable form (claims 12 and 23 respectively). Claim 10 has been canceled and combined into claim 1 by amendment, and Nakanishi (as applied to amended claim 1) is discussed above.

In view of the above, claims 1, 3-5, 9, 11, 12, 14, 15, 20-26, and 31-34, as amended, are in condition for allowance. Withdrawal of the rejections is requested, and a notification of allowability is respectfully solicited. If any questions or issues remain, the resolution of which the examiner feels would be advanced by a conference with applicants' attorney, he is invited to contact such attorney at the telephone number noted below.

Respectfully submitted,

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Date

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